STATEMENT OF GUY CARUSO

ADMINISTRATOR

ENERGY INFORMATION ADMINISTRATION

U.S. DEPARTMENT OF ENERGY

Before the

ENERGY AND NATURAL RESOURCES COMMITTEE

UNITED STATES SENATE

February 16, 2006

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss the long-term outlook for energy markets in the United States.

The Energy Information Administration (EIA) is an independent statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely, and relevant data, analysis, and projections for the use of the Congress, the Administration, and the public. We do not take positions on policy issues, but we do produce data, analysis, and forecasts that are meant to assist policymakers in their energy policy deliberations. EIA's baseline projections on energy trends are widely used by government agencies, the private sector, and academia for their own energy analyses. Because we have an element of statutory independence with respect to the analyses, our views are strictly those of EIA and should not be construed as representing those of the Department of Energy or the Administration.

The *Annual Energy Outlook* (*AEO*) provides projections and analysis of domestic energy consumption, supply, prices, and energy-related carbon dioxide emissions through 2030. The *Annual Energy Outlook 2006* (*AEO2006*) is based on Federal and State laws and regulations in effect on October 1, 2005. The potential impacts of pending or proposed legislation, regulations, and standards—or of sections of legislation that have been enacted but that require funds or implementing regulations that have not been provided or specified—are not reflected in the projections.

The *AEO2006* includes consideration of the impact of the Energy Policy Act of 2005 (EPACT2005), signed into law August 8, 2005. Consistent with the general approach adopted in the *AEO*, the reference case does not consider those sections of EPACT2005 that require appropriations for implementation or sections with highly uncertain impacts on energy markets. For example, EIA does not try to anticipate the policy response to the many studies required by EPACT2005 or the impacts of the research and development funding authorizations included in the law. The *AEO2006* reference case only includes those sections of EPACT2005 that establish specific tax credits, incentives, or standards—about 30 of the roughly 500 sections in the legislation. These provisions include the extension and expansion of the Federal tax credit for renewable generation through 2007 and incentives intended to stimulate the development of advanced coal and nuclear plants.

EPACT2005 also has important implications for energy consumption in the residential and commercial sectors. In the residential sector, EPACT2005 sets efficiency standards for torchiere lamps, dehumidifiers, and ceiling fans and creates tax credits for energy-efficient furnaces, water heaters, and air conditioners. It also allows home builders to claim tax credits for energy-efficient new construction. In the commercial sector, the legislation creates efficiency standards that affect energy use in a number of commercial applications. It also includes investment tax credits for solar technologies, fuel cells, and microturbines. These policies are expected to help reduce energy use for space conditioning and lighting in both sectors.

The *AEO2006* is not meant to be an exact prediction of the future but represents a likely energy future, given technological and demographic trends, current laws and regulations, and consumer behavior as derived from known data. EIA recognizes that projections of energy markets are highly uncertain and subject to many random events that cannot be foreseen such as weather, political disruptions, and technological breakthroughs. In addition to these phenomena, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than expected in the projections. The complete *AEO2006*, which EIA is releasing this week, includes a large number of alternative cases intended to examine these uncertainties. The following discussion summarizes the highlights from the *AEO2006* reference case for the major categories of U.S. energy prices, demand, and supply and also includes the results of some alternative cases.

U.S. Energy Outlook

Energy Prices

EIA has reassessed its long-term outlook on energy prices for the *AEO2006* reference case (**Figure 1**), including much higher world oil prices than in recent *AEO*s. World oil markets have been extremely volatile for the past several years, and the reference case oil price path in recent *AEO*s did not fully reflect the causes of that volatility and their implications for future oil prices. In the *AEO2006* reference case, world oil supplies are assumed to be tighter, as the combined productive capacity of the members of the Organization of the Petroleum Exporting Countries (OPEC) does not increase as much as previously projected.

In the *AEO2006*, world crude oil prices, which are now expressed by EIA in terms of the average price of imported low-sulfur crude oil to U.S. refiners, are projected to fall from current levels to about $47 per barrel in (2004 dollars) in 2014, then rise to $54 per barrel in 2025 and $57 per barrel in 2030. The projected price in 2025 is about $21 per barrel higher than projected in last year's reference case (**Figure 2**).

Geopolitical trends, the adequacy of investment and the availability of crude oil resources and the degree of access to them, are all inherently uncertain. To evaluate the implications of uncertainty about world crude oil prices, the *AEO2006* includes two other price cases, a high price case and a low price case, based on alternative world crude oil price paths. The cases are designed to address the uncertainty about the market behavior of OPEC. Although the price cases reflect alternative long term trends, they are not designed to reflect short-term, year-to-year volatility in world oil markets, nor are they intended to span the full range of possible outcomes. In the low price case, world crude oil prices are projected to decline gradually to $34 per barrel (2004 dollars) through 2020 and then remain at that level through 2030. In the high price case, oil prices grow throughout the projection horizon, reaching more than $96 per barrel (2004 dollars) in 2030.

In the *AEO2006* reference case, average wellhead prices for natural gas in the United States decline from $5.49 per thousand cubic feet (2004 dollars) in 2004 to $4.46 per

thousand cubic feet in 2016 as the availability of new import sources and increased drilling expand available supply. After 2016, wellhead prices are projected to increase gradually, reaching $5.92 per thousand cubic feet in 2030. Growth in liquefied natural gas (LNG) imports, Alaskan production, and lower-48 production from unconventional sources are not expected to increase sufficiently to offset the impacts of resource depletion and increased demand in the lower-48 States. Projections of wellhead prices in the low and high price cases reflect alternative assumptions about the cost and availability of natural gas, including imports of LNG. In the low price case, the average wellhead price is projected to decline more rapidly through 2015 than in the reference case, then increases more slowly to 2030, reaching $4.97 per thousand cubic feet (2004 dollars). In the high price case, the pattern is reversed, and the projected wellhead price reaches $7.71 per thousand cubic feet in 2030.

In the *AEO2006*, continued increases in coal production, including an increase in relatively high-cost eastern coal, result in a gradual increase in the average minemouth price from $20.07 per ton (2004 dollars) in 2004 to $22.23 per ton in 2010. After 2010, the price declines gradually to $20.20 in 2020, as the average utilization of mining capacity and the production share of higher-cost Central Appalachian coal decline. Between 2020 and 2030, prices are projected to increase as rising natural gas prices and the need for baseload generating capacity lead to the construction of many new coal-fired generating plants. The substantial investment in new mining capacity during this period, combined with low productivity growth and rising utilization of mining capacity, lead to a recovery in the average minemouth coal price to $21.73 per ton (2004 dollars) in 2030, just under the 2010 average.

Average delivered electricity prices are projected to decline from 7.6 cents per kilowatthour (2004 dollars) in 2004 to a low of 7.1 cents per kilowatthour in 2015 as a result of an increasingly competitive generation market and a decline in natural gas prices. After 2015, average real electricity prices are projected to increase, reaching 7.5 cents per kilowatthour in 2030.

Energy Consumption

Total energy consumption is projected to grow at about one-third the rate (1.1 percent per year) of gross domestic product (GDP), with the strongest growth in energy consumption for electricity generation and transportation and commercial uses. Transportation energy demand is expected to increase from 27.8 quadrillion British thermal units (Btu) in 2004 to 39.7 quadrillion Btu in 2030, an average growth rate of 1.4 percent per year (**Figure 3**). Most of the growth in demand between 2004 and 2030 occurs in light-duty vehicles (57 percent of total growth), followed by heavy truck travel (24 percent of growth) and air travel (11 percent of growth). Delivered commercial energy consumption is projected to grow at a more rapid average annual rate of 1.6 percent between 2004 and 2030, reaching 12.4 quadrillion Btu in 2030, consistent with growth in commercial floorspace. The most rapid increase in commercial energy demand is projected for electricity used for office equipment, computers, telecommunications, and miscellaneous small appliances.

Delivered industrial energy consumption is projected in the *AEO2006* to reach 32.2 quadrillion Btu in 2030, growing at an average rate of 0.9 percent per year between 2004 and 2030, as efficiency improvements in the use of energy only partially offset the impact of growth in manufacturing output. Delivered residential energy consumption is projected to grow from 11.4 quadrillion Btu in 2004 to 14.0 quadrillion Btu in 2030, an average rate of 0.8 percent per year. This growth is consistent with population growth and household formation. The most rapid growth in residential energy demand is projected to be in the demand for electricity used to power computers, electronic equipment, and small appliances.

The reference case includes the effects of several policies aimed at increasing energy efficiency in both end-use technologies and supply technologies, including minimum efficiency standards and voluntary energy savings programs. However, the impact of efficiency improvement on energy consumption could differ from what is shown in the reference case, as illustrated in **Figure 4** which compares energy consumption in three cases. The 2005 technology case assumes no improvement in the efficiency of available equipment beyond that available in 2005. By 2030, 8 percent more energy (10.3 quadrillion Btu) is required than in the reference case. The high technology case assumes that the most energy-efficient technologies are available earlier with lower costs and higher efficiencies. By 2030, total energy consumption is 8.2 quadrillion Btu, or 6 percent, lower in the high technology case when compared with the reference case.

Total petroleum demand is projected to grow at an average annual rate of 1.1 percent in the *AEO2006* reference case forecast, from 20.8 million barrels per day in 2004 to 27.6 million barrels per day in 2030 (**Figure 5**) led by growth in transportation uses, which account for 66 percent of total petroleum demand in 2004, increasing to 72 percent in 2030. Improvements in the efficiency of vehicles, planes, and ships are more than offset by growth in travel. In the low and high price cases, petroleum demand in 2030 ranges from 29.6 to 25.2 million barrels per day, respectively.

Total demand for natural gas is projected to increase at an average annual rate of 1.2 percent from 2004 to 2020, then remain relatively flat through 2030. With continued growth in natural gas prices in the latter half of the projection, natural gas is expected to lose market share to coal in the electric power sector. Natural gas use in the power sector is projected to decline by 14 percent between 2020 and 2030.

Total coal consumption is projected to increase from 1,104 million short tons in 2004 to 1,784 million short tons in 2030, growing by 1.9 percent per year. About 92 percent of the coal is currently used for electricity generation. Coal remains the primary fuel for electricity generation and its share of generation (including end-use sector generation) is expected to increase from about 50 percent in 2004 to 57 percent in 2030. Total coal consumption in the electric power sector is projected to increase by an average of 1.5 percent per year, from 1,015 million short tons in 2004 to 1,502 million short tons in 2030. Another fast growing market for coal is expected in coal-to-liquids (CTL) plants. These plants convert coal to synthetic gas and create clean diesel fuel, while producing surplus electricity as a byproduct. In the reference case, coal use in CTL plants is projected to reach 190 million short tons by 2030, or 11 percent of the total coal use. In

the high price case, coal used in CTL plants is projected to reach 420 million short tons. In the low price case, however, the plants are not expected to be economical within the 2030 time frame.

Total electricity consumption, including both purchases from electric power producers and on-site generation, is projected to grow from 3,729 billion kilowatthours in 2004 to 5,619 billion kilowatthours in 2030, increasing at an average rate of 1.6 percent per year. The most rapid growth (2.2 percent per year) occurs in the commercial sector, as building floorspace is expanded to accommodate growing service industries. Growing use of electricity for computers, office equipment, and small electrical appliances is partially offset in the *AEO2006* forecast by improved efficiency. EPACT2005 sets residential efficiency standards for torchiere lamps, dehumidifiers, and ceiling fans and creates tax credits for energy-efficient furnaces, water heaters, and air conditioners. It also allows home builders to claim tax credits for energy-efficient new construction. In the commercial sector, the law creates efficiency standards that affect energy use in a number of commercial applications.

Total marketed renewable fuel consumption, including ethanol for gasoline blending, is projected to grow by 2.0 percent per year in the reference case, from 6.0 quadrillion Btu in 2004 to 10.0 quadrillion Btu in 2030, largely as a result of State mandates for renewable electricity generation and the effect of production tax credits. About 60 percent of the projected demand for renewables in 2030 is for grid-related electricity generation (including combined heat and power), and the rest is for dispersed heating and cooling, industrial uses, and fuel blending.

Energy Intensity

Energy intensity, as measured by primary energy use per dollar of GDP (2000 dollars), is projected to decline at an average annual rate of 1.8 percent, with efficiency gains and structural shifts in the economy offsetting growth in demand for energy services (**Figure 6**). The projected rate of energy intensity decline in the *AEO2006* approximately matches the decline rate between 1992 and 2004 (1.9 percent per year). Energy-intensive industries' share in overall industrial output is projected to fall at an average rate of 0.8 percent per year, a slower decline rate than the 1.3 percent per year experienced from 1992 to 2004.

Historically, energy use per person has varied over time with the level of economic growth, weather conditions, and energy prices, among many other factors. During the late 1970s and early 1980s, energy consumption per capita fell in response to high energy prices and weak economic growth. Starting in the late 1980s and lasting through the mid-1990s, energy consumption per capita increased with declining energy prices and strong economic growth. Per capita energy use is projected to increase by an average of 0.3 percent per year between 2004 and 2030 in the *AEO2006* reference case, with relatively high energy prices moderating the demand for energy services and promoting interest in efficiency improvements in buildings, transportation, and electricity generation.

Energy Production and Imports

Total energy consumption is expected to increase more rapidly than domestic energy supply through 2030. As a result, net imports of energy are projected to meet a growing share of energy demand.

Petroleum. Projected U.S. crude oil production increases from 5.4 million barrels per day in 2004 to a peak of 5.9 million barrels per day in 2014 as a result of increased production offshore, predominantly in the deep waters of the Gulf of Mexico. Beginning in 2015, U.S. crude oil production is expected to decline, falling to 4.6 million barrels per day in 2030. Total domestic petroleum supply (crude oil, natural gas plant liquids, refinery processing gains, and other refinery inputs), increases from 8.6 million barrels per day in 2004 to a peak of 10.5 million barrels per day in 2021, then remains at about that level through 2030. Production from coal liquefaction compensates for a decline in crude oil production in the latter half of the projection period.

In 2030, net petroleum imports, including both crude oil and refined products on the basis of barrels per day, are expected to account for 62 percent of demand in the reference case, up from 58 percent in 2004 (**Figure 7**). Under alternative oil price projections, the 2030 import fraction ranges from 68 in the low price case to 53 percent in the high price case. **Figure 8** compares the impact of the *AEO2006* reference, high price, and low price cases on U.S. oil production, consumption, and imports.

In the U.S. energy markets, the transportation sector consumes about two-thirds of all petroleum products and the industrial sector about one-quarter. The remaining 10 percent is divided among the residential, commercial, and electric power sectors. With limited opportunities for fuel switching in the transportation and industrial sectors, large price-induced changes in U.S. petroleum consumption are unlikely, unless changes in petroleum prices are very large or there are significant changes in the efficiencies of petroleum-using equipment.

Higher crude oil prices spur greater exploration and development of domestic oil supplies, reduce demand for petroleum, and slow the growth of oil imports in the high price case compared to the reference case. Total domestic petroleum supply in 2030 is projected to be 1.5 million barrels per day (15 percent) higher in the high price case than in the reference case. Production in the high case includes 1.9 million barrels per day in 2030 of synthetic petroleum fuel produced from coal and natural gas, compared to 0.8 million barrels per day in the reference case (**Figure 9**). Total net imports in 2030, including crude oil and refined products, are reduced from 17.2 million barrels per day in the reference case to 13.3 million barrels per day in the high price case.

Natural Gas. Domestic dry natural gas production is projected to increase from 18.5 trillion cubic feet in 2004 to 21.6 trillion cubic feet in 2019, before declining to 20.8 trillion cubic feet in 2030 in the *AEO2006* reference case (**Figure 10**). Lower-48 offshore production is projected to fall slightly from the 2004 level of 4.3 trillion cubic feet and then grow steadily through 2015, peaking at 5.1 trillion cubic feet as new resources come on line in the Gulf of Mexico. After 2015, lower-48 offshore production

declines to 4.0 trillion cubic feet in 2030. Unconventional natural gas production is projected to grow from 7.5 trillion cubic feet in 2004 to 9.5 trillion cubic feet in 2030. With completion of an Alaskan natural gas pipeline in 2015, total Alaskan production is projected to increase from 0.4 trillion cubic feet in 2004 to 2.2 trillion cubic feet in 2018 and to remain at about that level through 2030.

Net pipeline imports are expected to decline from 2004 levels of 2.8 trillion cubic feet to about 1.2 trillion cubic feet by 2030 due to resource depletion and growing domestic demand in Canada. The *AEO2006* reflects an expectation that growth in Canada's unconventional natural gas production, primarily from coal seams, will not be adequate to offset a decline in conventional production.

To meet a projected demand increase of 4.5 trillion cubic feet from 2004 to 2030 and to offset an estimated 1.6 trillion cubic feet reduction in pipeline imports, the United States is expected to depend increasingly on imports of LNG. LNG imports in the *AEO2006* reference case are projected to increase from 0.6 trillion cubic feet in 2004 to 4.4 trillion cubic feet in 2030. Besides expansion of three of the four existing onshore U.S. LNG terminals (Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana), and the completion of two U.S. terminals currently under construction, new facilities serving the Gulf Coast, Southern California, and New England are added in the reference case. LNG imports in 2030 in the high price case, where expected natural gas demand is lower, are projected at 1.9 trillion cubic feet, less than half of the 4.4 trillion cubic feet projected in the reference case.

One area of uncertainty examined through sensitivity cases regards the rate of technological progress and its affect on future natural gas supply and prices. Technological progress affects natural gas production by reducing production costs and expanding the economically recoverable natural gas resource base. In the slow oil and gas technology case, advances in exploration and production technologies are assumed to be 50 percent slower than those assumed in the reference case, which are based on historical rates. As a result, domestic natural gas development costs are higher, production is lower, wellhead prices are higher at $6.36 per thousand cubic feet in 2030 (compared to $5.92 in the reference case) (2004 dollars), natural gas consumption is reduced, and LNG imports are higher than in the reference case. In 2030, natural gas production is 18.8 trillion cubic feet (10 percent lower than in the reference case), net natural gas imports are 6.4 trillion cubic feet (14 percent higher), and domestic natural gas consumption is 25.6 trillion cubic feet (5 percent lower). Conversely, the rapid technology case assumes 50 percent faster improvement in technology. In that case, natural gas production in 2030 is 24.4 trillion cubic feet (17 percent higher than in the reference case), net natural gas imports are 4.5 trillion cubic feet (20 percent lower), domestic natural gas consumption is 29.4 trillion cubic feet (9 percent higher), and the average wellhead price is $5.20 per thousand cubic feet.

Coal. As domestic coal demand grows in the *AEO2006* forecast, U.S. coal production is projected to increase at an average rate of 1.6 percent per year, from 1,125 million short tons in 2004 to 1,703 million short tons in 2030. Production from mines west of the Mississippi River is expected to provide the largest share of the incremental coal

production. In 2030, nearly two-thirds of coal production is projected to originate from the western States (**Figure 11**).

Electricity Generation

In the *AEO2006* reference case, total electricity generation increases by 50 percent between 2004 and 2030, growing at an average rate of 1.6 percent per year. Coal is projected to supply about 70 percent of the increase in electricity generation (including generation in the end-use sectors) from 2004 to 2030. Generation from coal is projected to grow from about 1,970 billion kilowatthours in 2004 to 3,380 billion kilowatthours in 2030 in the reference case. In 2030 coal is projected to meet 57 percent of generation, up from 50 percent in 2004 (**Figure 12**). Between 2004 and 2030, *AEO2006* projects that 174 gigawatts of new coal-fired generating capacity will be constructed, including 19 gigawatts at coal-to-liquids plants.

Generation from natural gas is projected to increase from about 700 billion killowatthours in 2004 to 1,102 billion killowatthours in 2020, but decline by 10 percent between 2020 and 2030 in the face of growing natural gas prices and the availability of a new generation of coal plants. The natural gas share of electricity generation is projected to decline from 18 percent in 2004 to 17 percent in 2030.

The use of renewable technologies for electricity generation is projected to grow, stimulated by improved technology, higher fossil fuel prices, and extended tax credits in EPACT2005 and in State renewable energy programs (renewable portfolio standards, mandates, and goals). The expected impacts of State renewable portfolio standards, which specify a minimum share of generation or sales from renewable sources, are included in the projections. The *AEO2006* reference case also includes the extension and expansion of the Federal tax credit for renewable generation through December 31, 2007, as enacted in EPACT2005. Total renewable generation in the *AEO2006* reference case, including hydroelectric power and renewables-fueled combined heat and power generation, is projected to grow by 1.7 percent per year, from 358 billion kilowatthours in 2004 to 559 billion kilowatthours in 2030. The renewable share of electricity generation is projected to remain at about 9 percent of total generation from 2004 to 2030.

Nuclear generating capacity in the *AEO2006* is projected to increase from about 100 gigawatts (about 10 percent of total U.S. generating capacity) in 2004 to 109 gigawatts in 2019 and to remain at that level through 2030. The total projected increase in nuclear capacity between 2004 and 2030 includes 3 gigawatts expected to come from uprates of existing plants that continue operating and 6 gigawatts of capacity at newly constructed power plants, stimulated by the provisions in EPACT2005. The new nuclear plants are expected to begin operation between 2014 and 2020. Total nuclear generation is projected to grow from 789 billion kilowatthours in 2004 to 871 billion kilowatthours in 2030 in the *AEO2006*. The share of electricity generated from nuclear is projected to decline from 20 percent in 2004 to 15 percent in 2030.

The *AEO2006* reference case assumptions for the cost and performance characteristics of new nuclear technologies are based on cost estimates by government and industry

analysts, allowing for uncertainties about new, unproven designs. Two advanced nuclear cost cases analyze the sensitivity of the projections to lower costs for new nuclear power plants. The advanced nuclear cost case assumes capital and operating costs 20 percent below the reference case in 2030, reflecting a 31-percent reduction in overnight capital costs from 2006 to 2030. The vendor estimate case assumes reductions relative to the reference case of 18 percent initially and 44 percent by 2030. These costs are consistent with estimates from British Nuclear Fuels Limited for the manufacture of its AP1000 advanced pressurized-water reactor. Cost and performance characteristics for all other technologies are assumed to be the same as those in the reference case.

Projected nuclear generating costs in the advanced nuclear cost cases are competitive with the generating costs projected for new coal- and natural-gas-fired units toward the end of the projection period. In the advanced nuclear cost case, 34 gigawatts of new nuclear capacity are added by 2030, while the greater cost reductions in the vendor estimates case bring on 77 gigawatts by 2030 (**Figure 13**). The additional nuclear capacity displaces primarily new coal capacity.

The Clean Air Interstate Rule and the Clean Air Mercury Rule, issued by the U.S. Environmental Protection Agency in March 2005, are expected to result in large reductions of emissions from power plants. In the *AEO2006* reference case, projected emissions of sulfur dioxide from electric power plants in 2030 are 66 percent lower than the 2004 level, emissions of nitrogen oxide are 42 percent lower, and emissions of mercury are 71 percent lower.

Energy-Related Carbon Dioxide Emissions

Carbon dioxide emissions from energy use are projected to increase from 5,900 million metric tons in 2004 to 8,114 million metric tons in 2030 in the *AEO2006*, an average annual increase of 1.2 percent (**Figure 14**). The energy-related carbon dioxide emissions intensity of the U.S. economy is projected to fall from 550 metric tons per million dollars of GDP in 2004 to 351 metric tons per million dollars of GDP in 2030, an average decline of 1.5 percent per year. Projected increases in carbon dioxide emissions primarily result from a continued reliance on coal for electricity generation and on petroleum fuels in the transportation sector.

Conclusions

Continuing economic growth in the United States is expected to stimulate more energy demand, with fossil fuels remaining the dominant source of energy. The U.S. dependence on foreign sources of oil is expected to continue increasing. Petroleum imports that accounted for 58 percent of total U.S. petroleum demand in 2004 are expected to account for 62 percent of total demand by 2030 in our reference case, with most of the increase resulting from increased consumption for transportation.

Furthermore, although natural gas production in the United States is expected to increase, natural gas imports, particularly LNG, are expected to grow rapidly. Total net LNG

imports in the United States and the Bahamas are projected to increase from 0.6 trillion cubic feet in 2004 to 4.4 trillion cubic feet in 2030 in our reference case. In the United States, reliance on domestic natural gas supply to meet demand is projected to fall from 83 percent in 2004 to 78 percent in 2030. The growing dependence on imports in the United States occurs despite efficiency improvements in both the consumption and the production of natural gas.

This concludes my testimony, Mr. Chairman and members of the Committee. I will be happy to answer any questions you may have.

Figure 1. Energy Prices, 1980-2030 (index, 1980=1.0)

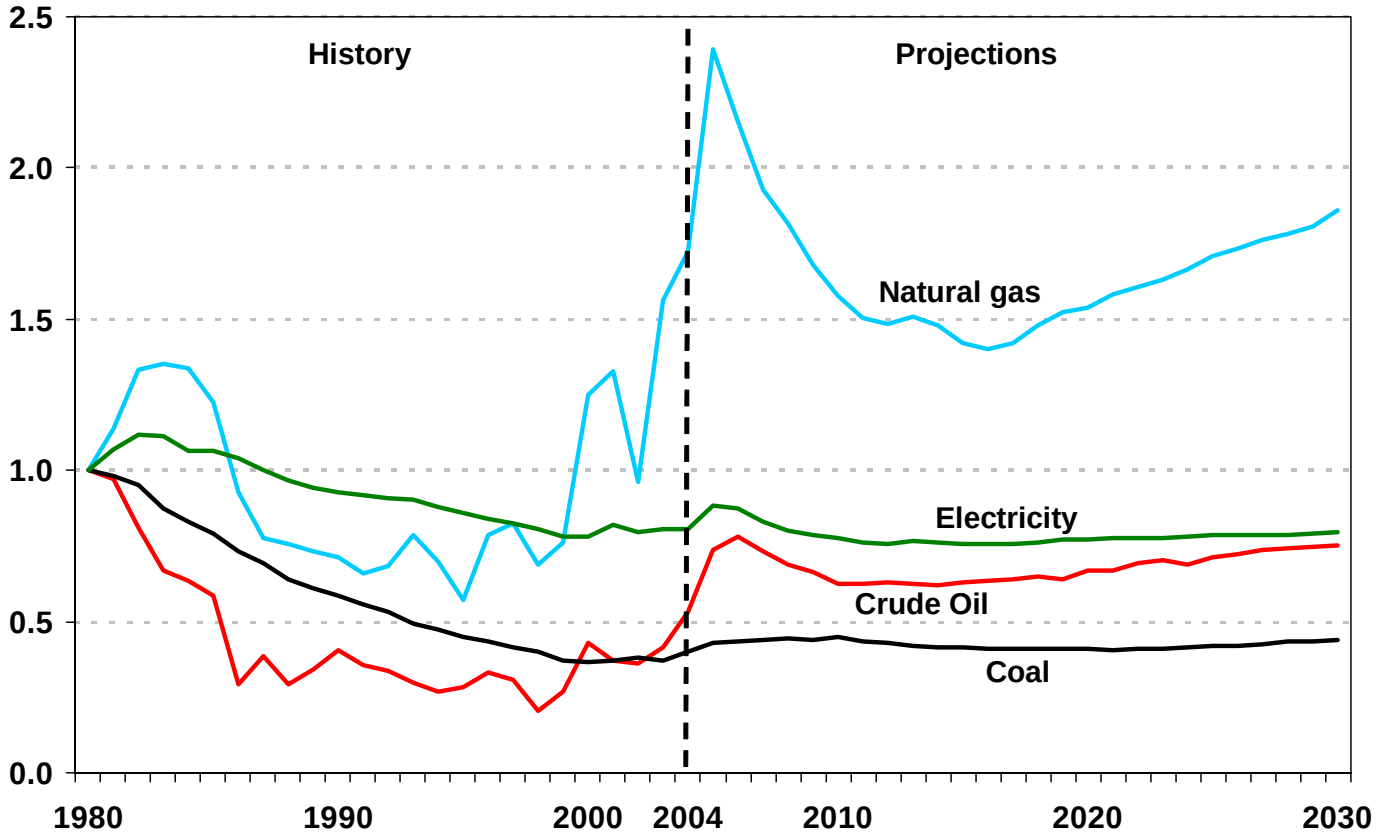

Figure 2. World Oil Prices in Four Cases, 1980-2025 (2004 dollars per barrel)

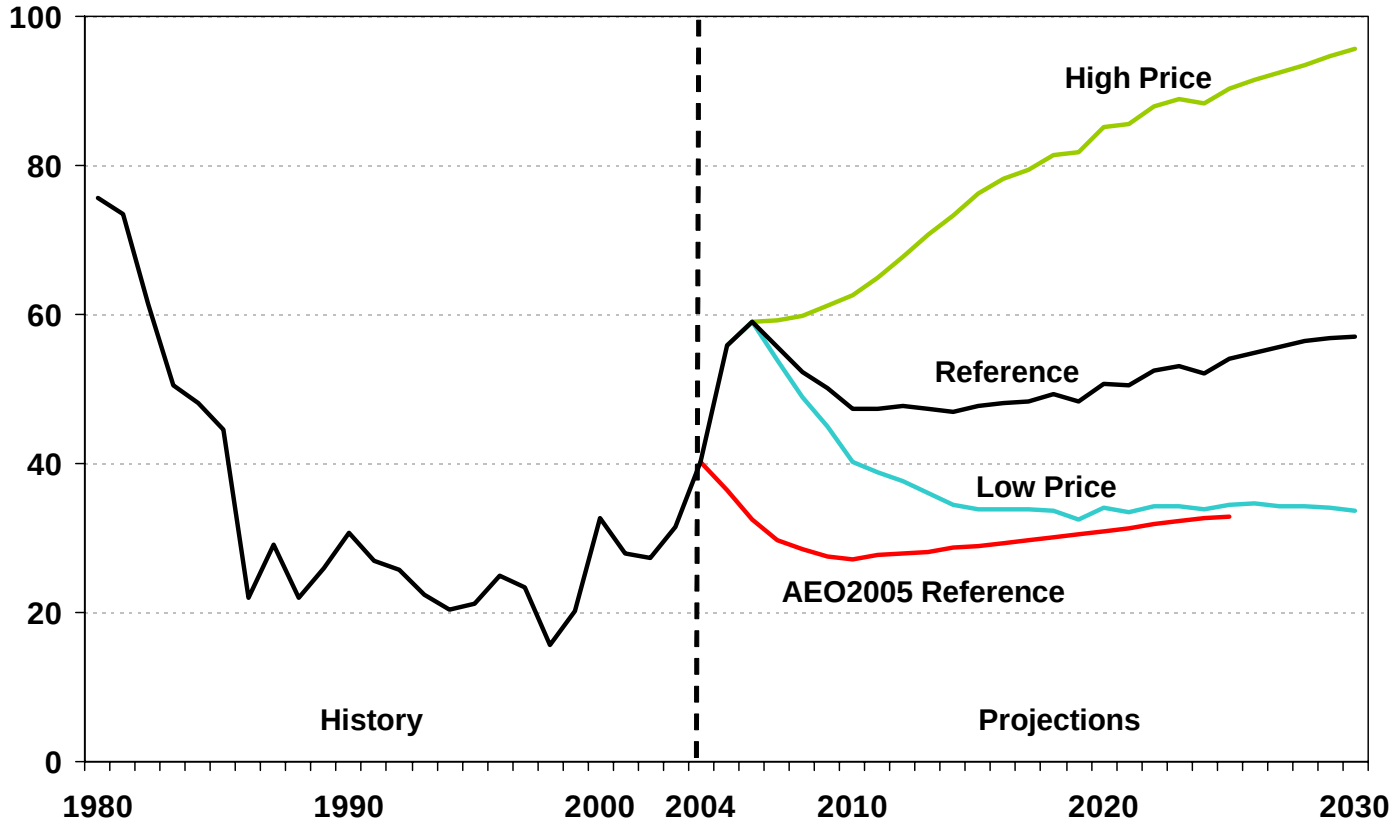

Figure 3. Delivered Energy Consumption by Sector, 2004 and 2030 (quadrillion Btu)

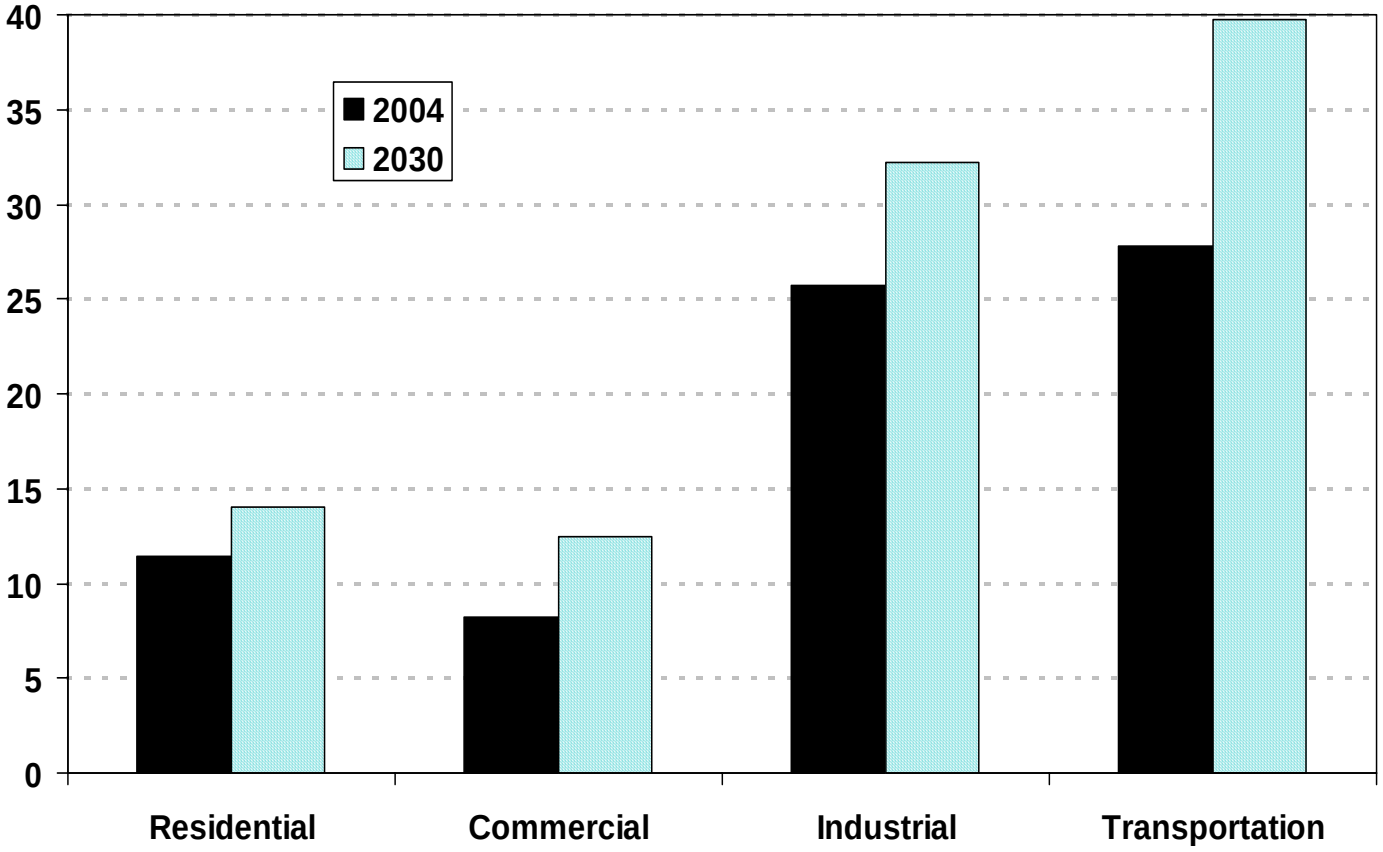

Figure 4. U.S. Energy Consumption in Three Cases, 1980-2030 (quadrillion Btu)

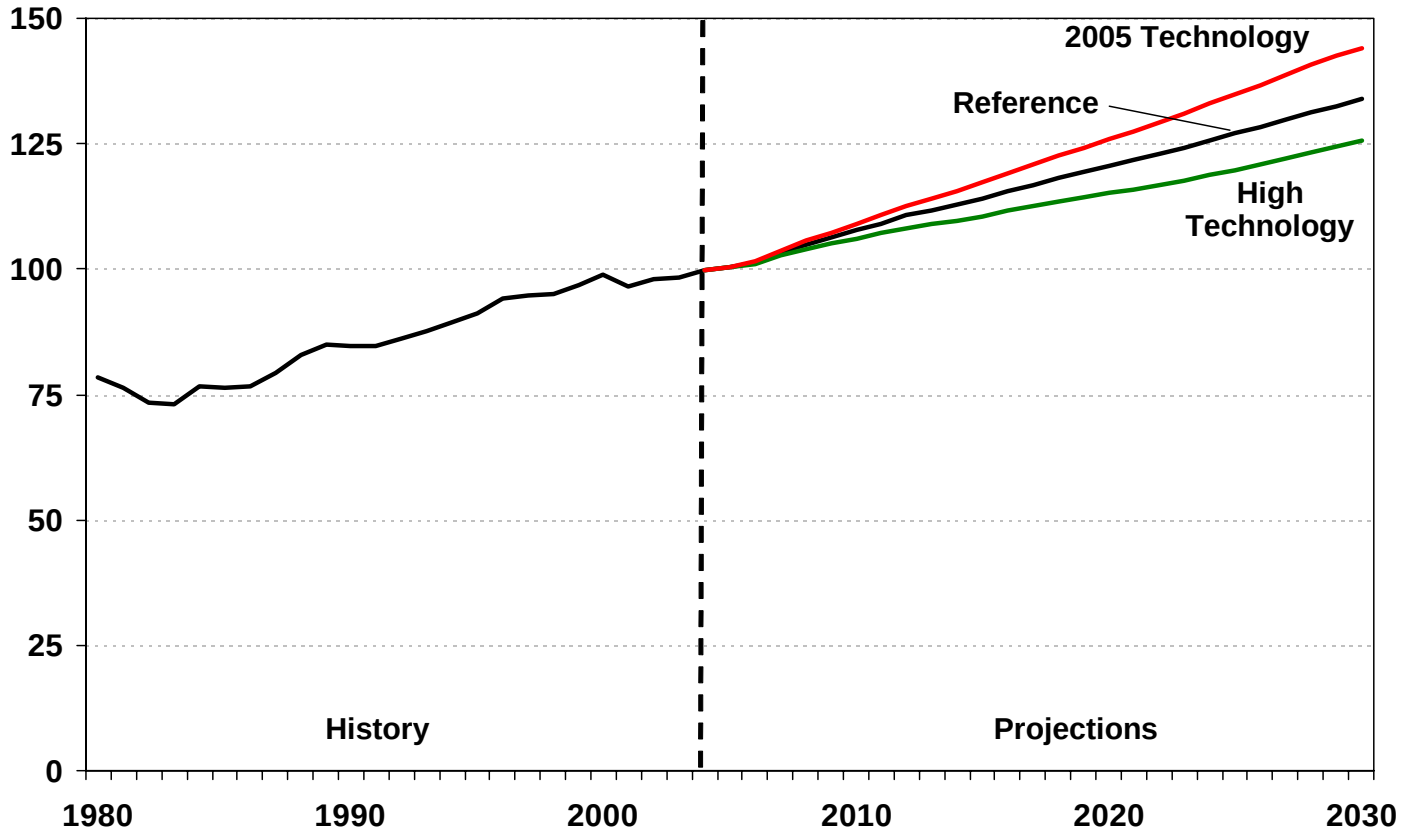

Figure 5. U.S. Energy Consumption by Fuel, 1980-2030 (quadrillion Btu)

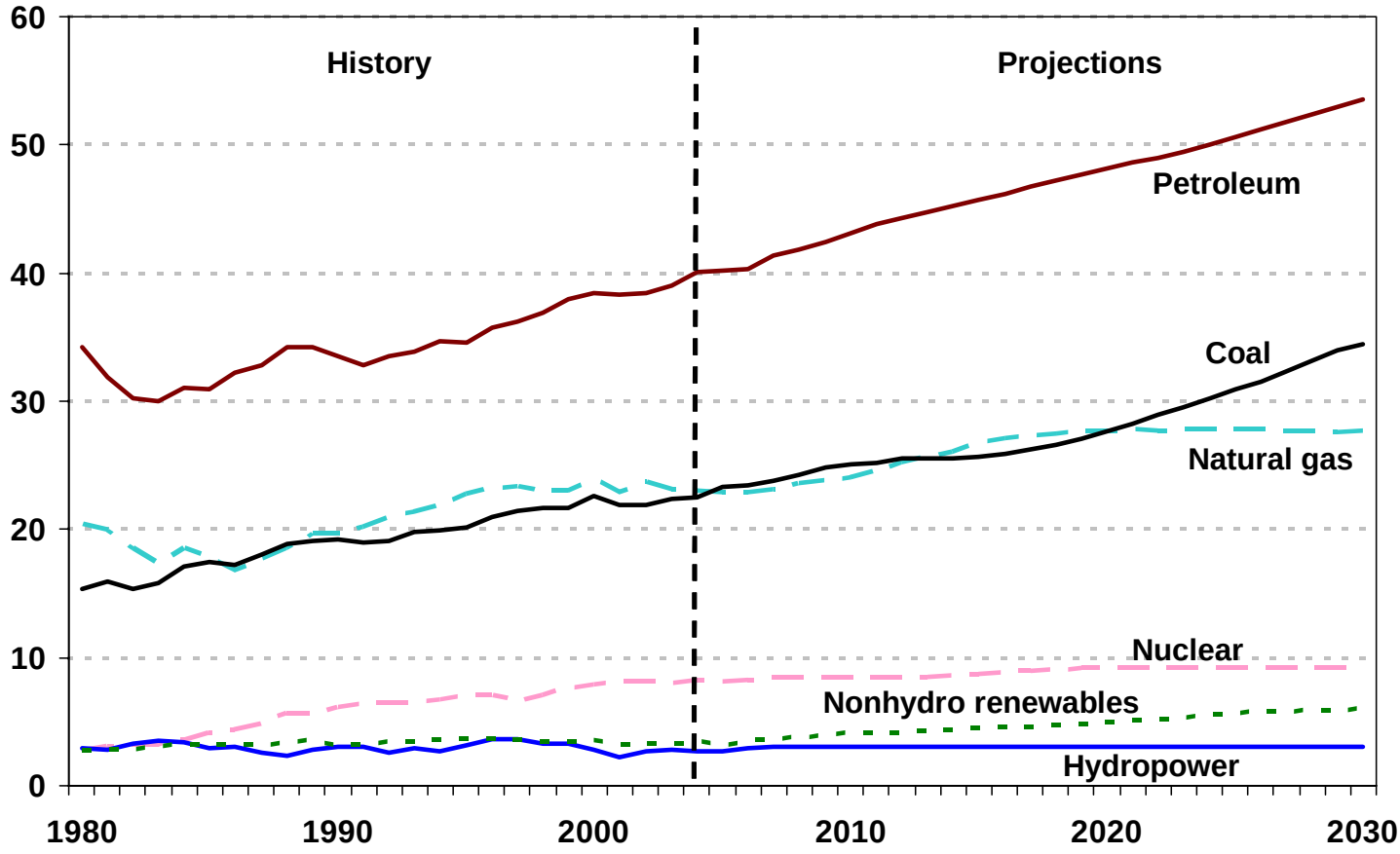

Figure 6. Energy Use per Capita and per Dollar of Real Gross Domestic Product, 1980-2030 (index, 1980 = 1)

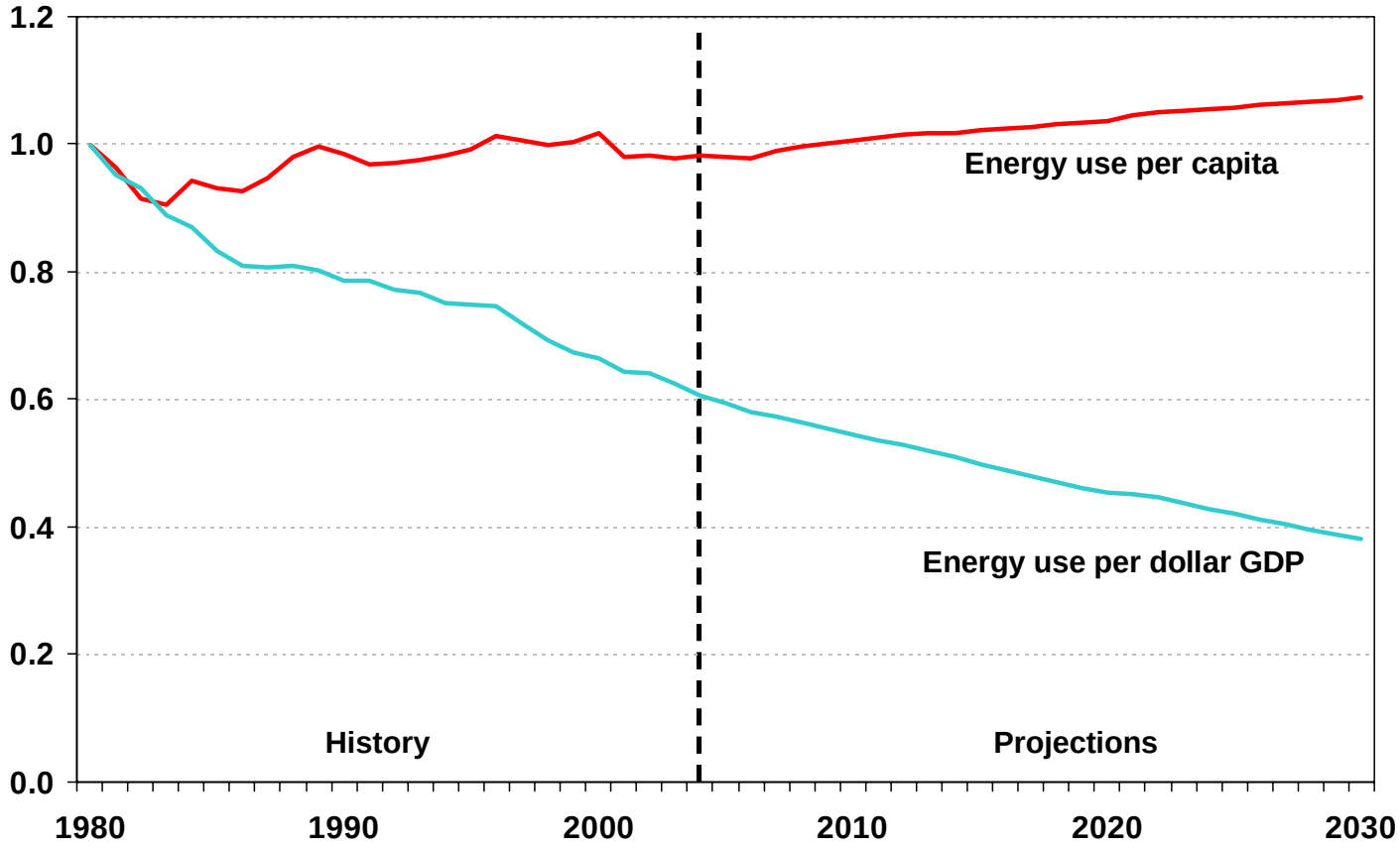

Figure 7. Petroleum Supply, Consumption, and Net Imports, 1980-2030 (million barrels per day)

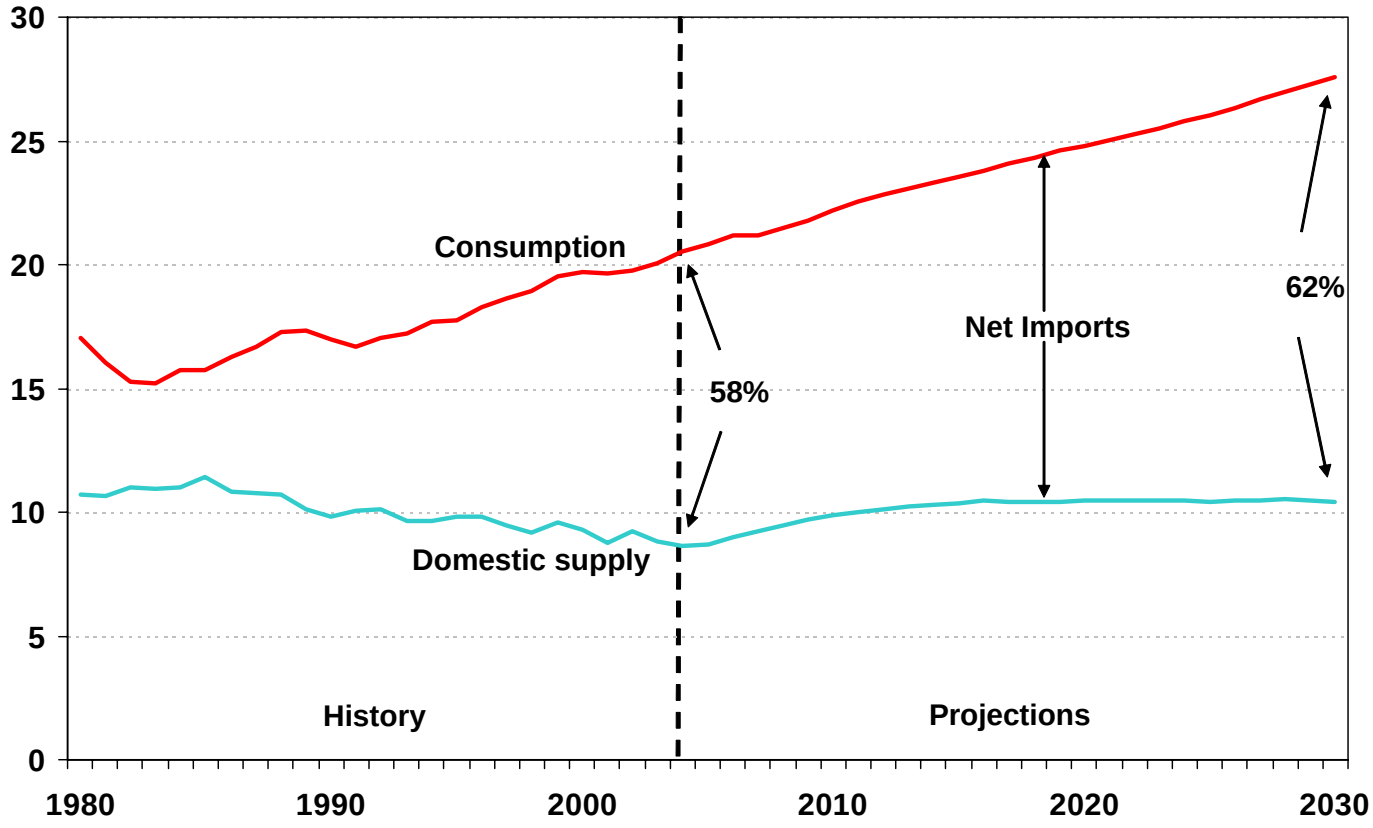

Figure 8. Petroleum Supply, Consumption, and Imports in Three Cases, 1980-2030 (million barrels per day)

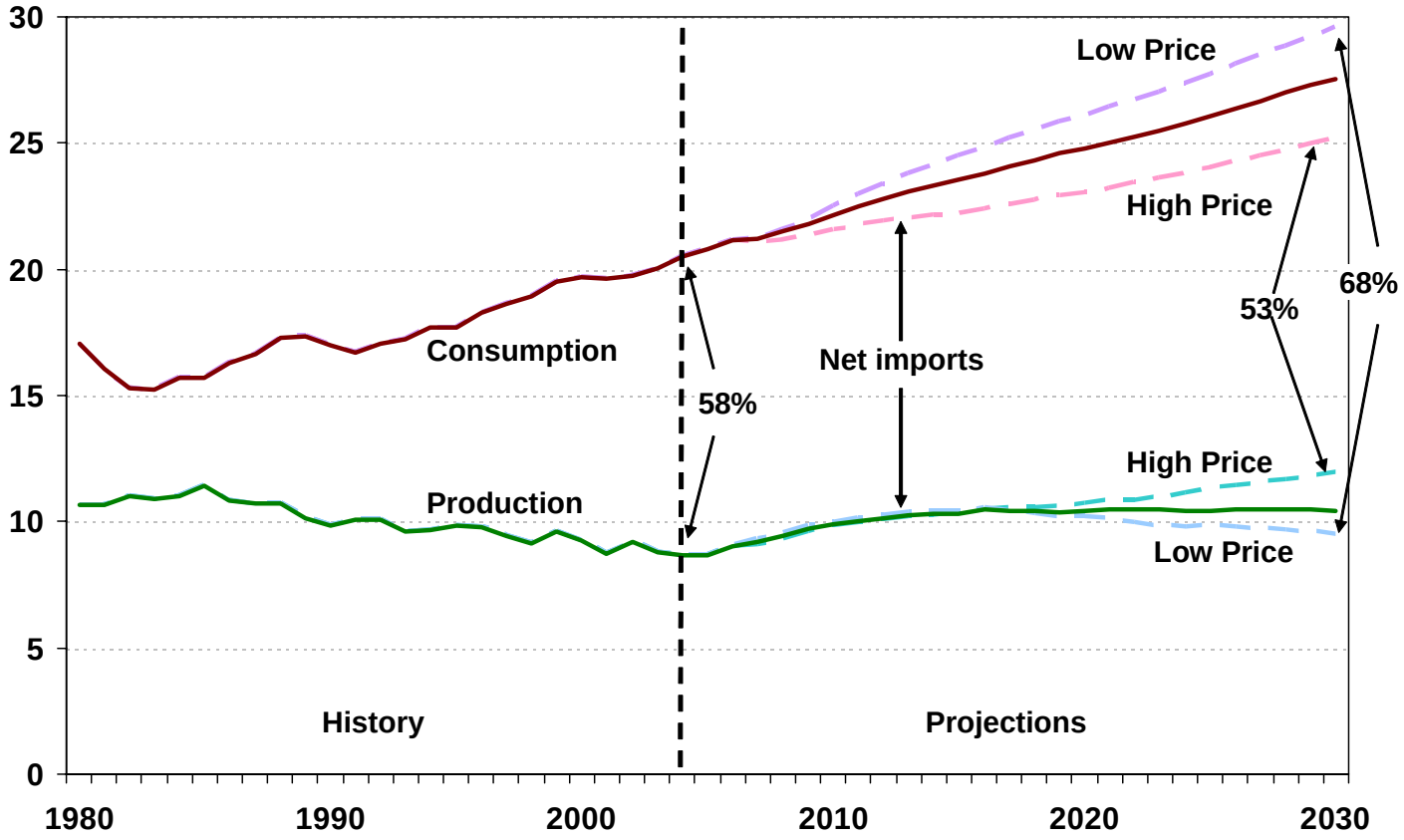

Figure 9. Petroleum Liquids Supply from Coal and Natural Gas in Two Cases, 2004-2030 (thousand barrels per day)

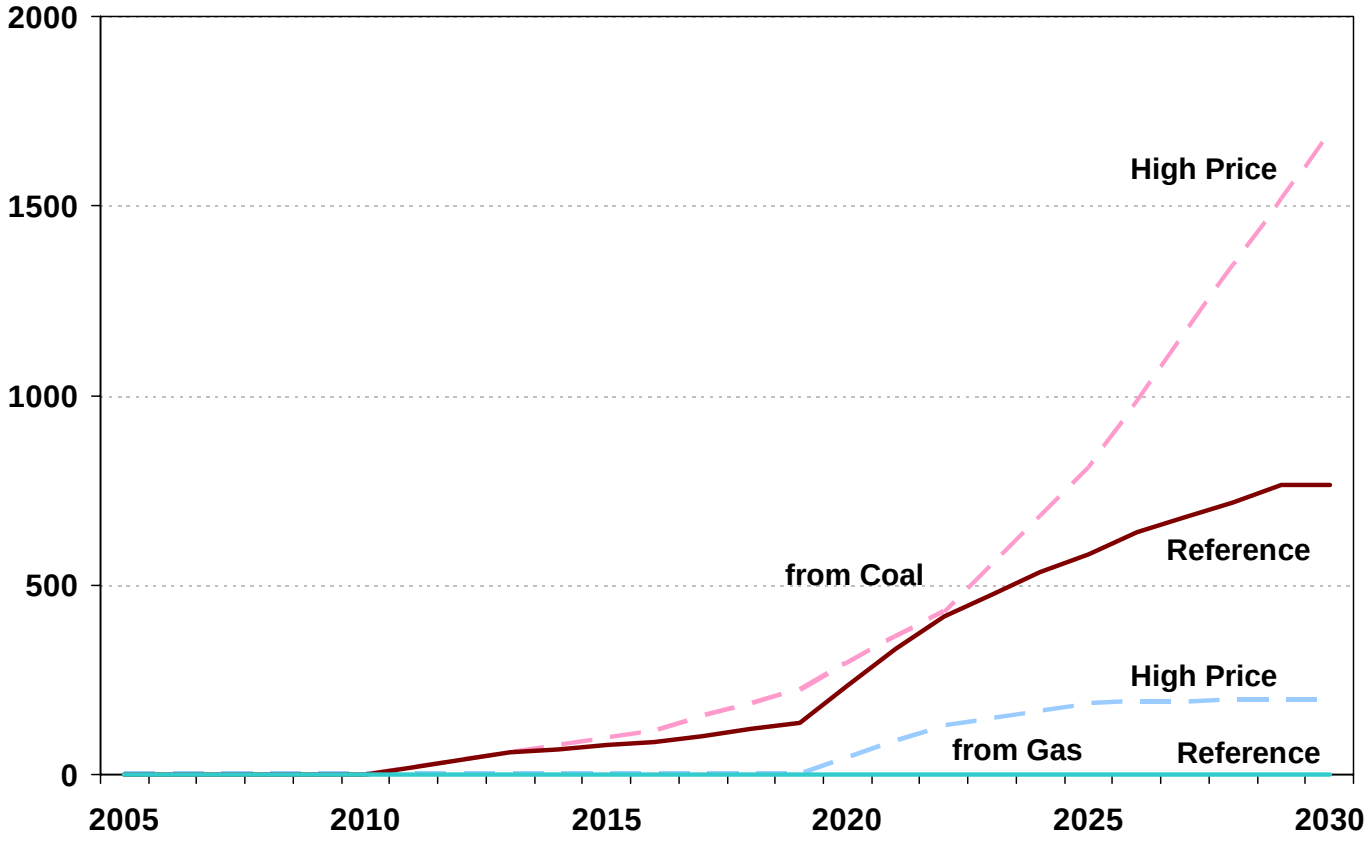

Figure 10. Natural Gas Production, Consumption, and Imports, 1980-2030 (trillion cubic feet)

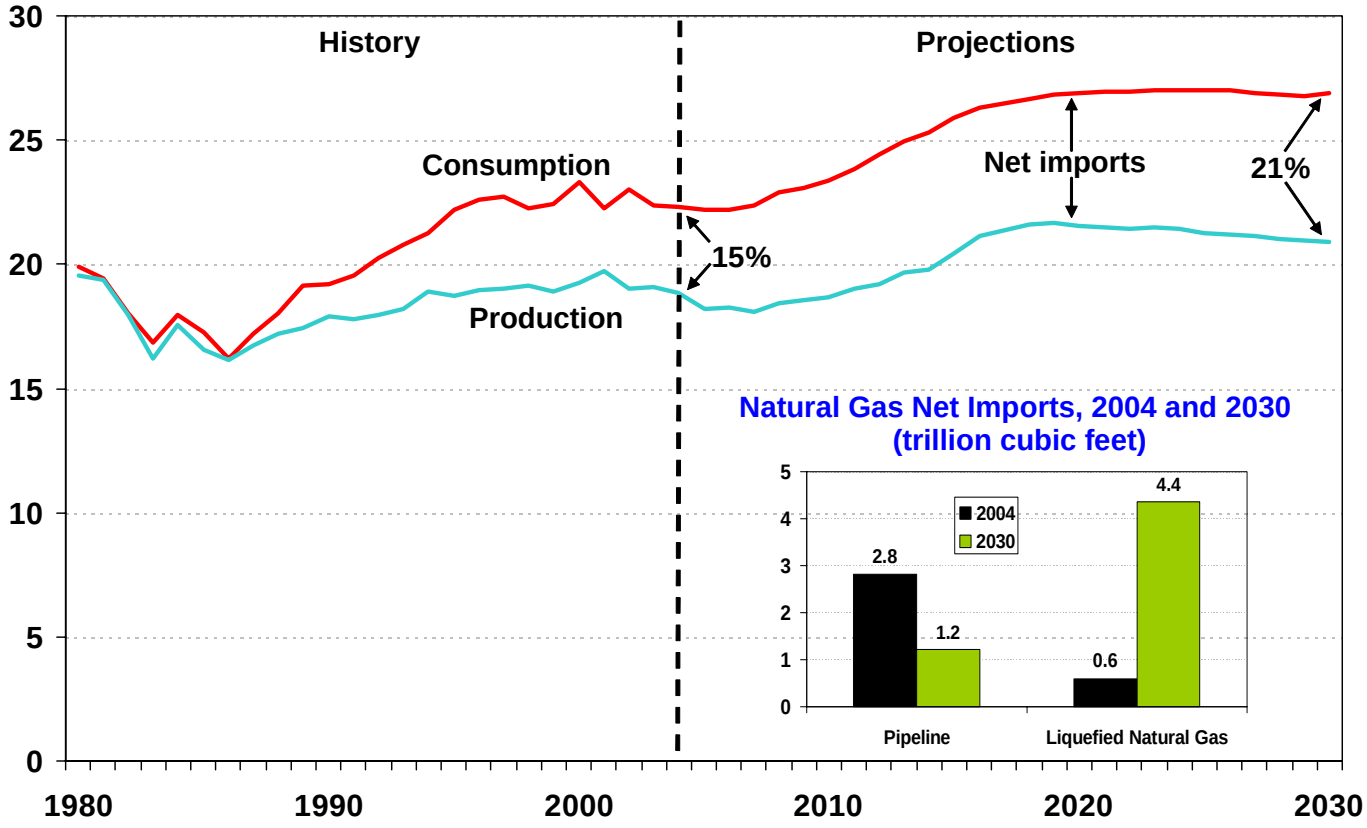

Figure 11. U.S. Coal Production by Region, 1980-2030 (million short tons)

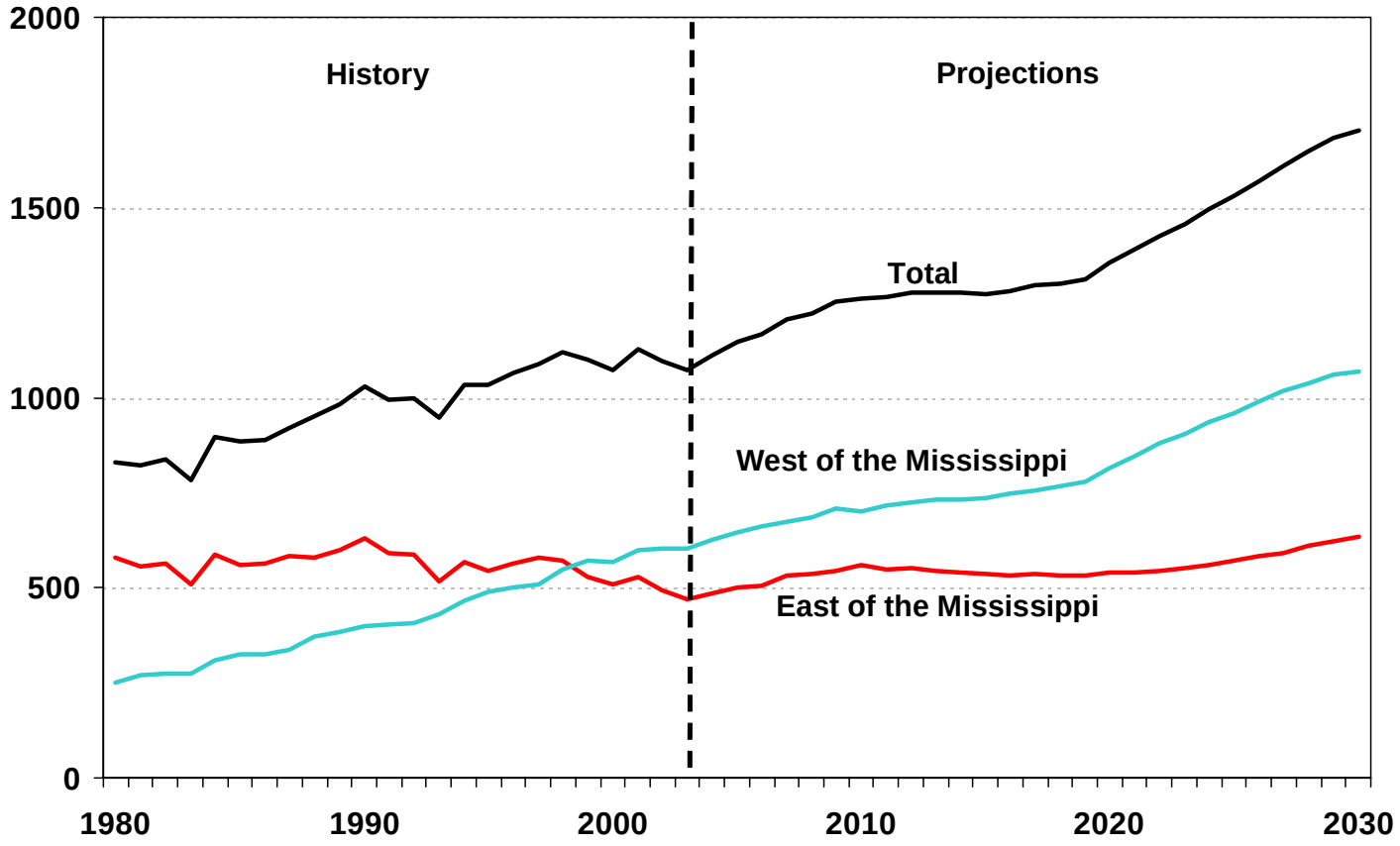

Figure 12. U.S. Electricity Generation by Fuel, 1980-2030 (billion kilowatthours)

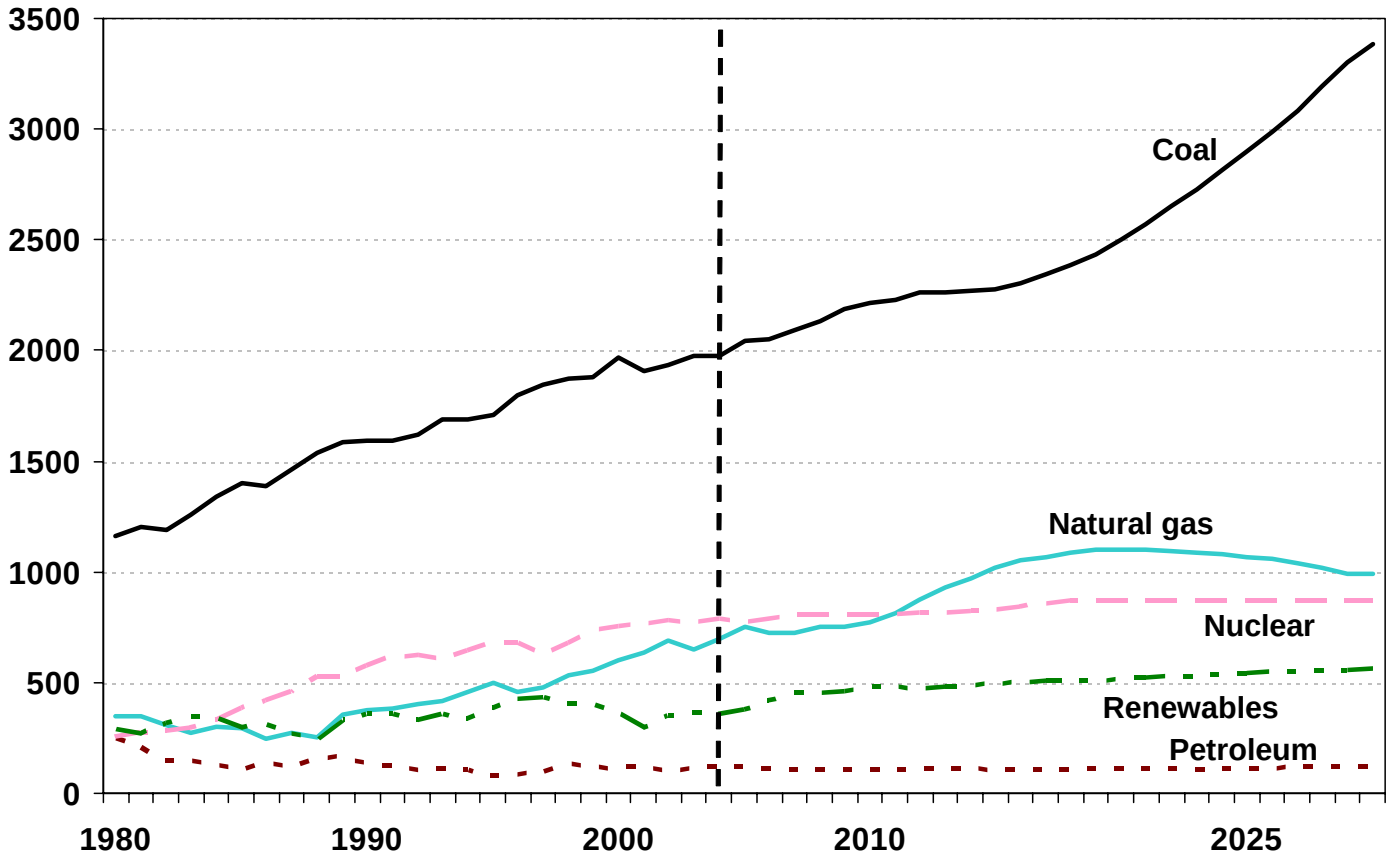

Figure 13. U.S. Electricity Generation Capacity by Nuclear Power in Three Cases, 1980-2030 (gigawatts)

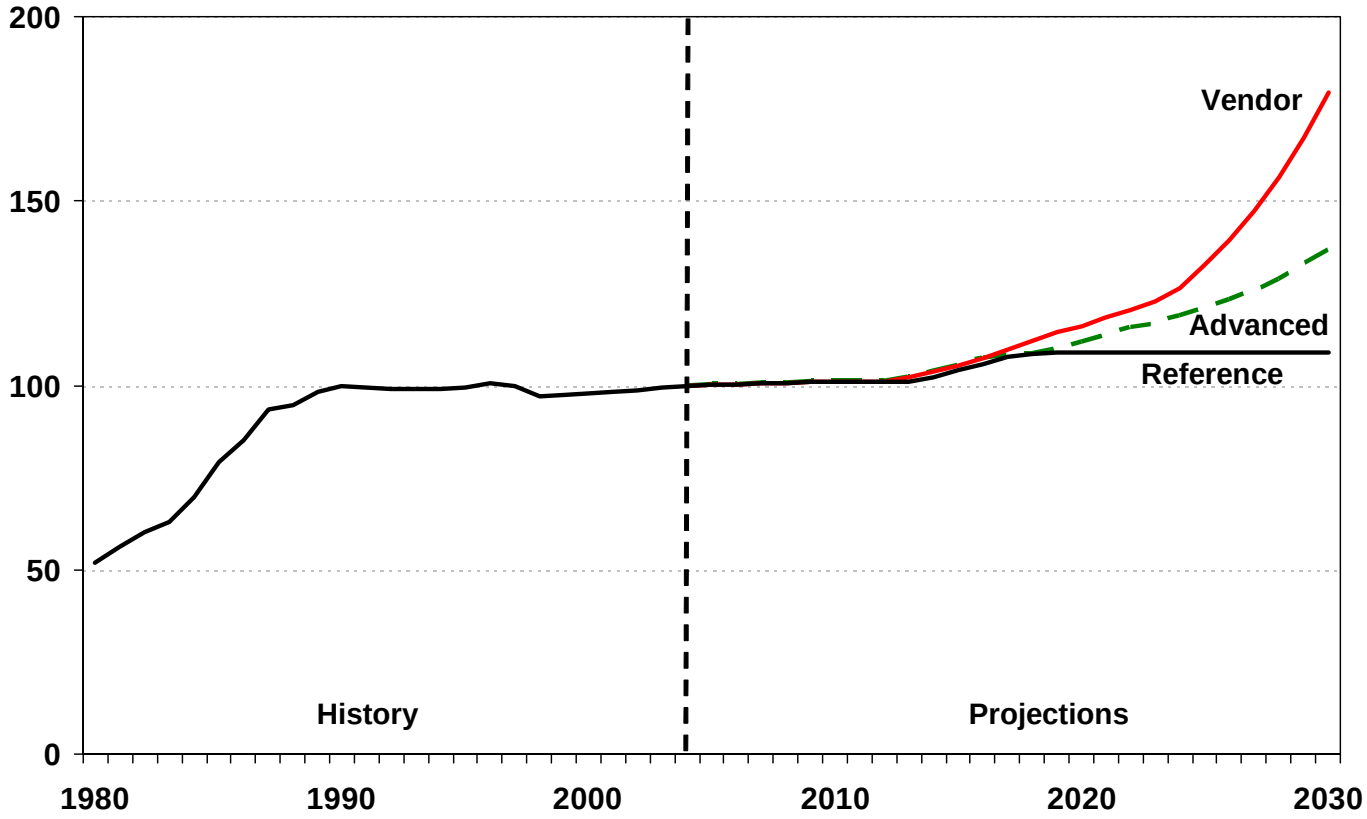

Figure 14. U.S. Carbon Dioxide Emissions by Sector and Fuel, 1990-2030 (million metric tons)